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Appendix A: Non-Native Invasive Plant Species and Their Impact on the Army

Non-Native Invasive Plant Species History and Regulations

Introduction

Non-native invasive plant species (NNIPS) pose a significant conservation and compliance challenge for cultural and natural resources management on military lands. NNIPS management on military lands is complex. Successful natural resource management is critical to the Army mission, as it represents the primary means of sustaining the carrying capacity of testing and training lands. For effective management of NNIPS, an understanding of the biology and ecology of the species is needed to be able to rank priorities for the prevention of new introductions and controlling spread (Campbell 1993). NNIPS competitively displace native flora and adversely affect ecosystem integrity and function by altering water, energy, nutrient, and disturbance cycles, which in turn, can cause loss of biodiversity, increased water and wind erosion, altered fire regimes, damage to culturally significant resources, and degradation of threatened and endangered species habitat. Invasion of NNIPS can lead to violations of the Endangered Species Act, Clean Water Act, Clean Air Act, Sykes Act, National Historic Preservation Act, as well as Army regulations and memoranda. Moreover, NNIPS negatively impact military operations, reduce military carrying capacity, compromise long-term sustainability of training lands, diminish training realism, and restrict training land availability. Without immediate and aggressive action targeted at identifying, mapping, monitoring, and controlling NNIPS on Army training lands, the magnitude of these negative impacts will increase significantly with time.

In addition to the existing statutes and regulations that indirectly mandate the control of invasive species, Presidential Executive Order (EO) 13112 requires each Federal agency to prevent the introduction of invasive species, and detect and rapidly respond to and control populations of such species in a cost-effective and environmentally sound manner. The Clinton Administration foresaw that the introduction of NNIPS has completely degraded many natural native ecosystems to the extent that the land and the ecosystem have been completely and perhaps permanently altered, and thereby destroyed. This type of alteration has led to the eradication or displacement of many native plant and animal species (Sheley 1999). With the large number of Threatened and Endangered Species (TES), both flora and fauna, it is imperative that the ecosystems in which TES reside be preserved and rehabilitated when and where possible. EO 13112 is a significant step in a long process that addresses the preservation of our natural areas.

- This document was developed to increase awareness of NNIPS on military training lands and provide guidance not policy for the control and management of NNIPS. EO 13112 and the Army Policy Guidance for Management and Control of Invasive Species indicate that Federal agencies need to prevent the introduction and spread of NNIPS when and where possible. As such, installation land managers need to avoid possible introduction of NNIPS and utilize native plant species when and where possible, the authors of EO 13112 and the Army Policy Guidance for Management and Control of Invasive Species acknowledge that it is not possible in all cases.

- The NNIPS lists in this document were developed with currently established Federal and states NNIPS lists and in conjunction with state experts.

- This is a guidance document and has no legal standing.

Non-Native Invasive Plant Species Definitions

Numerous definitions exist; terms are interchangeable, and argued over by scientists. For this document, the following definitions and terminology will apply.

Alien/Exotic: Any species, with respect to a particular ecosystem, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem (EO 13112).

Ecosystem: An ecosystem is a functional system that includes the organisms of a natural community together with their environment.

Invasive: An invasive species is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health, i.e., a non-native plant that out-competes the surrounding native species within a given ecosystem and whose introduction does or is likely to cause harm economically, environmentally, or to human health.

Native: Native species occur naturally in an ecosystem; they existed within North America prior to European settlement. Indigenous is interchangeable with native.

Naturalized: Naturalized species are introduced (non-native, alien, exotic) plants that are actively adapting, growing, and spreading without any form of cultivation.

Non-native: Non-native species are introduced species (via human activity) that occur outside of their natural range/bio-region/ecosystem.

Noxious: Noxious plant is the legal term used by state and Federal agencies to denote plant species that are or have the capability to pose serious threat to agriculture and wildlife.

Other definitions include any plant designated by a Federal, state, or county government to be injurious to public health, agriculture, recreation, wildlife, or any public or private property. Since the definition of an "invasive" species depends on a person's background, employment, personal opinion, this document will use the definition as set in EO 13112. According to EO 13112, an invasive species is "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."

Non-Native Invasive Plant Species Background

The majority of NNIPS affecting the United States originated in Europe and Asia (Sheley 1999). Most of these species were introduced for ornamental, agricultural, and/or conservation purposes, while some were introduced inadvertently through various carriers or vectors (e.g., within packing material). Many of these NNIPS now are found throughout the United States and are spreading rapidly. Examples of NNIPS include; salt cedar (*Tamarix*), kudzu (*Pueraria montana*), cheatgrass (*Bromus tectorum*), and spotted knapweed (*Centaurea biebersteinii*). The rapid rate of spread of certain species has caused alarm for private, state, and Federal land managers.

NNIPS are problematic for numerous reasons. These species, once removed from their native habitats, may no longer react in the same manner. Because they were taken out of their natural ecosystem and placed in a new ecosystem in which they did not evolve, they no longer had natural predators (animal, plant, insect, or microbial) to keep them in check. Without natural enemies to inhibit their expansion, NNIPS can become invasive to their new ecosystem, overtaking that ecosystem and forming monocultures.

Without control measures these NNIPS quickly form monocultures by out-competing native plant communities. They accomplish this through one or more of the following adaptations: abundant seed production, long-term seed viability, fast growth rates, deep tap roots, allelopathic capabilities, low palatability, etc. As with any monoculture, environmental problems can arise such as altered soil chemistry and nutrient cycles, increased wind and water erosion, altered water cycles, increased fuel for wild land fires, and decreased biodiversity.

Nutrient cycling and other natural disturbances such as fire regime can be altered through infestation of NNIPS (D'Antonio 1998). It was found that spotted knapweed increased surface water runoff by 56% and soil erosion was 192% higher than that of native bunchgrass plots (Lacey 1989). NNIPS in an ecosystem can negatively affect wildlife and their habitat. The reduction of forage quantity and quality obviously will impact wildlife. It was found that elk, deer, and bison habitat infested with leafy spurge and spotted knapweed had dramatic reductions in desirable forage (Trammel 1995).

NNIPS generally thrive in areas of disturbance. Many NNIPS are early successional species with the ability to colonize recently disturbed sites (Baker 1986). By nature, military training causes disturbance, allowing for the introduction and spread of NNIPS. It is the role of the land manager to prevent, control, and monitor current and potential invasive species on the installation. Force training and other operational and land management considerations unique to the U.S. Army create significant challenges for complying with the intent of the Executive Order, e.g., rapid establishment of vegetation for erosion control. Army Policy and Guidance for the Implementation of EO 13112 addresses the Army's objectives to meet EO 13112 (see Appendix E).

Non-Native Invasive Plant Species Impact on the Military

Currently over 100 million acres of land in North America are infected with NNIPS. Each year approximately 3 million additional acres are infested with NNIPS. The Department of Defense (DoD) manages over 25 million acres of land under its stewardship for sustainable, mission-directed training and testing. Of the 25 million acres, the Army is responsible for 12 million acres, with the concomitant high potential risk for infestation. With encroachment reducing available acres for Army training while indirectly concentrating wildlife habitat and TES refuges, it is imperative that the Army optimize its current land base for training while protecting TES habitat. With an introduction of NNIPS, training

lands may become unavailable due to quarantine or fire hazard. Consequently, Army land managers have the daunting challenge of prevention, control, and eradication of NNIPS.

With the introduction of a NNIPS, training lands risk quarantine and inaccessibility for troop training. Training realism is also drastically reduced and the chance of spreading NNIPS within and/or between installations becomes likely. Risks associated with NNIPS include a reduction in training realism (monocultures) and training land suitability while increasing the chance of spread both on and off post. Delay in deployment could result from a NNIPS infestation. State and Federal weed and seed laws mandate that the transportation of certain weeds or seeds is illegal or limited to certain seed numbers or weight by volume. Both tracked and wheeled vehicles are a perfect vector for NNIPS. If vehicles are suspected or were in training areas with NNIPS infestations, those vehicles would need to be weed- and seed-free prior to the translocation/transportation to installations and locations both within and outside the United States.

Cases of military introduction and/or spread of NNIPS

Few cases have been well documented on the introduction of a NNIPS via military activity. One case was the introduction of Ginkokai (*Leucaena glauca*) to the Pacific Islands during WWII by Japanese soldiers who used it as a camouflage. On Whidbey Island, WA, the U.S. military planted Gorse (*Ulex europaeus*) around one of the gun emplacements as a deterrent to possible invaders; since then it has replaced much of the native plant community. It has been suggested that stands of *Phyteuma spicatum* and *P. nigrum* in Norway are a result of German encampments during WWII introduced through horse fodder (Alm 2000). Other introductions include Mesquite (*Prosopis juliflora*) on Ascension Island and rue-leaved saxifrage (*Saxifraga tridactylites*) on Victoria, BC, found only around former military areas (Professional Communication, Adolf Ceska, Program Ecologist, Conservation Data Centre, British Comunbia Ministry of Sustainable Resource Management, Victoria, BC, Canada, 3 August 2001). Siam weed (*Chromolaena odorata*) movement and spread in Australia has also been linked to military activity (Cruttwell McFadyen 1989).

Vectors of transportation/spread

Most anything can become a vector for a NNIPS. It is widely known that military vehicles, cargo, and equipment can “pick up” biological material capable of propagation (i.e., seeds, eggs, spores, rhizomes, etc.). Seeds and other propagative material have been collected from clothing, shoes, tires, undercarriages, tracks, and all types of equipment necessary to carry out a mission. This is why the U.S. Department of Agriculture (USDA) has strict regulations in place for military personnel and equipment returning from overseas. In one anecdotal report from Australia, it was noted that over 1000 Siam (*Chromolaena odorata*) seeds were collected from the wash water from one Australian military tank upon return from East Timor (see Figures A1 and A2). For the same military return, it took 300 staff members, using 20 wash racks, working for 3 months, 18 hours a day to remove all potential alien species contamination from the military equipment (Convention on Biological Diversity 2001 and the Australian Quarantine and Inspection Service (AQIS) http://www.affa.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060A1B01294).

Figure A2. Siam weed (*Chromolaena odorata*) in cooling system of a military armored personnel carrier after washing. Photo by Stuart Henson, AQIS.

Figure A1. Siam weed (*Chromolaena odorata*) in the air filter of a military armored personnel carrier after washing. Photo by Stuart Henson, AQIS.

There are many reasons why a military land manager should be concerned about NNIPS on local lands. As stated earlier, training lands are negatively impacted by NNIPS, resulting in the loss of TES habitat, soil, water, nutrients, and training acres. To fully address the issue, land managers need to look at the laws and regulations pertaining to NNIPS including:

- EO 13112 "Invasive Species" 3 February 1999 (see Appendix E)
- "Army Policy Guidance for Management and Control of Invasive Species" (see Appendix E)
- Army Regulation 200-2, *Environmental Effects of Army Actions,* 23 December 1988.
- DODI 4051-7, DoD Pest Management Program, 22 April 1996

  Currently land managers have to abide by Army Regulation 200-2 and DODI 4051-7, which have mandated a reduction in the use of pesticides on military lands. This reduction in herbicide use on Army lands has put the land manager in a position to closely review and develop alternatives for NNIPS control, eradication, and prevention.

- Clean Water Act (Federal Water Pollution Control Act of 1948), 33 USC Chapter 26, Subchapter I, Section 1251
- Clean Air Act, 42 USC, Chapter 85, Subchapter I, Section 7401
- Federal Noxious Weed Act of 1974, 3 January 1975, as amended 1988 and 1994
- State and County Weed and Seed Laws for dispersal and transportation

- Endangered Species Act, 16 USC, Chapter 35, Section 1531
- Sikes Act, 16 USC, Chapter 5C, Subchapter I, Section 670
- National Historic Preservation Act, 16 USC, Chapter 1A, Subchapter II, Section 470

Preventing, Controlling, and Monitoring Non-Native Invasive Plant Species

Non-Native Invasive Species Management Plan

The "*Army Policy Guidance Management and Control of Invasive Species"* states that NNIPS shall be managed within the context of the goals and objectives of an installation's Integrated Natural Resources Management Plan (INRMP). To meet these goals and objectives it is imperative that a Non-Native Invasive Species Management Plan (NNISMP) be drawn up for each at risk Army installations. A plan of action along with background information for all known, suspected, and high risk NNIPS is needed to facilitate control and eradication of NNIPS. For an example and outline of a basic NNISMP visit the following web site: http://www.weedcenter.org/management/management.html.

Within the NNISMP, a section on troop, natural resource personnel, and public education should be included, along with protocols for the following areas: integrated pest management, NNISP thresholds, vehicle and equipment washing, grazing, burning, quarantines, revegetation, monitoring, sighting and reporting for natural resource personnel and troops, and coordination between local land owners and county weed specialists.

Follow-up and document success

Success and failure for NNIPS management need to be reported through on-line chat boards, National Military Fish & Wildlife Association, and other military land management forums. Other land managers will benefit from your experiences. Besides benefiting others, it is vital that the land manager keep track of what has been done on the installation regarding NNIPS control and prevention. These records may become beneficial for pinpointing NNIPS on both installation land and adjacent lands.

Keep proper records

Yearly evaluations should be made on each project. Detailed records for each species should include; site locations, estimated acreage infested, all management practices, budget detail, recommendations, adverse or beneficial reactions to non-target species from treatment, and adverse or beneficial NNIPS reactions from military activities and TES. The reports should include sufficient information to determine the extent of the problem, treatment effectiveness, and future budgetary needs.

Pro-Active versus Reactive

Finally, it is in the best interest of installation lands to be pro-active versus reactive. Many problems that result from NNIPS are a symptom of a larger problem. Ecosystems that have had excessive soil disturbance, overgrazing, and roads/trails are susceptible to NNIPS infestations. Reducing unnecessary negative land impact stresses such as grazing and superfluous roads will produce a healthier ecosystem better equipped to combat NNIPS. Cost savings on labor, herbicides, equipment, and lost troop days would result if NNIPS were "nipped in the bud" prior to becoming large stands on training lands.

Use of Non-Native Species on Military Lands

Under certain conditions, the use of non-native plant species may be warranted. The use of a non-native plants for revegetation can be beneficial for erosion control, stream bank stabilization, trafficability, troop safety, etc. When deciding on a seed mix for a revegetation effort determine if native plant species will perform the necessary function, if not then utilize non-native plant species that are known not to be invasive to that region. Also, discuss your selection with your local Fish and Wildlife Service (FWS), Department of Natural Resources, or other knowledgeable individuals to determine each species potential for invasiveness. If the FWS currently approved seed mixes for land rehabilitation on your installation include non-native species, determine if the seed mix can be changed to include more native species while maintaining the integrity and function of the original seed mix.